Non-Base Ten Addition & Subtraction

I. Materials

A. Multi-base Blocks

II. Addition in Other Bases

1. Use the base-four blocks (purple) to solve the following addition problems regrouping as necessary and writing the answers in a base-four numeral.

a. $12_{four} + 13_{four} =$ _____ b. $21_{four} + 32_{four} =$ _____

c. $103_{four} + 22_{four} =$ _____ d. $120_{four} + 23_{four} =$ _____

e. $213_{four} + 112_{four} =$ _____ f. $233_{four} + 123_{four} =$ _____

g. $312_{four} + 1233_{four} =$ _____ h. $1032_{four} + 1332_{four} =$ _____

2. Use the base-three blocks (green) to solve the following addition problems regrouping as necessary and writing the answers in a base-three numeral.

a. $11_{three} + 10_{three} =$ _____ b. $11_{three} + 12_{three} =$ _____

c. $101_{three} + 22_{three} =$ _____ d. $112_{three} + 101_{three} =$ _____

e. $121_{three} + 110_{three} =$ _____ f. $201_{three} + 102_{three} =$ _____

g. $1022_{three} + 221_{three} =$ _____ h. $1010_{three} + 1122_{three} =$ _____

3. Complete each addition table for the indicated bases.

a. base five

+	0	1	2	3	4
0	0	1	2	3	4
1			3		10
2		3			11
3					
4	4			12	

b. base two

+	0	1
0	0	
1		10

c. base eight

+	0	1	2	3	4	5	6	7
0	0	1						
1			3					10
2								
3								
4								
5					11			
6								
7							15	

d. base twelve

+	0	1	2	3	4	5	6	7	8	9	T	E
0	0	1	2	3								
1			3							T		10
2		3										
3												
4												
5								10				
6												
7												
8												
9												
T											18	
E												

4. Use your knowledge of other bases and the addition tables to solve the following addition problems. Do not convert any of the problems to base-ten.

a. 243_{five}
$\underline{+\,132_{five}}$

b. 101_{two}
$\underline{+\,111_{two}}$

c. 526_{eight}
$\underline{+\,435_{eight}}$

d. 947_{twelve}
$\underline{+\,1T6_{twelve}}$

e. 412_{five}
$\underline{+\,243_{five}}$

f. 10001_{two}
$\underline{+\,11111_{two}}$

g. 374_{eight}
$\underline{+\,625_{eight}}$

h. $6E7_{twelve}$
$\underline{+\,6T6_{twelve}}$

III. Subtraction in Other Bases

1. Use the base-four blocks (purple) to solve the following subtraction problems regrouping as necessary and writing the answers in a base-four numeral.

a. $21_{four} - 3_{four} =$ _____

b. $23_{four} - 12_{four} =$ _____

c. $31_{four} - 13_{four} =$ _____

d. $123_{four} - 101_{four} =$ _____

e. $202_{four} - 33_{four} =$ _____

f. $311_{four} - 233_{four} =$ _____

g. $1032_{four} - 233_{four} =$ _____

h. $2000_{four} - 312_{four} =$ _____

2. Use the base-three blocks to solve the following subtraction problems regrouping as necessary and writing the answers in a base-three numeral.

a. $22_{three} - 12_{three} =$ _____

b. $21_{three} - 12_{three} =$ _____

c. $112_{three} - 22_{three} =$ _____

d. $201_{three} - 22_{three} =$ _____

e. $210_{three} - 111_{three} =$ _____

f. $221_{three} - 112_{three} =$ _____

g. $2011_{three} - 212_{three} =$ _____

h. $2101_{three} - 1112_{three} =$ _____

3. Use your knowledge of other bases and the addition tables completed earlier to solve the following subtraction problems. Do not convert any of the problems to base-ten.

a. 424_{five}
$- \underline{232_{five}}$

b. 1100_{two}
$- \underline{1001_{two}}$

c. 604_{eight}
$- \underline{227_{eight}}$

d. 845_{twelve}
$- \underline{28T_{twelve}}$

e. 1023_{five}
$- \underline{324_{five}}$

f. 100001_{two}
$- \underline{11001_{two}}$

g. 1275_{eight}
$- \underline{576_{eight}}$

h. $48T2_{twelve}$
$- \underline{E68_{twelve}}$